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Original Research Article

Knowledge, attitude and perception of biostatistics among post-graduate students in Vokkaligara Sangha Dental College and Hospital, Bengaluru: a cross-sectional study

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ABSTRACT

Background: Biostatistics is essential for postgraduate dental research and evidence-based practice. However, many students find it challenging to understand statistical concepts and apply them confidently in research. This study assessed and compared the knowledge, attitude and perception of Biostatistics among 1st, 2nd and 3rd year postgraduate dental students across various specialties.
Methods: A cross-sectional study was conducted among 97 postgraduate dental students at Vokkaligara Sangha Dental College and Hospital, Bengaluru. Data were collected using a validated, self-administered questionnaire covering knowledge, attitude and perception of Biostatistics. Descriptive and Inferential statistics, including one-way ANOVA and Chi-square test, were used for analysis. Statistical significance was set at $p<0.05$.
Results: The participants had a mean age of 25 years; 81.4% were female and 18.6% were male. Knowledge scores differed significantly across academic years, with 3rd year students demonstrating the highest scores ($p<0.05$). Attitude scores also varied significantly, with 3rd year students showing the most favourable attitude ($p<0.05$). Perception scores were highest among 3rd year students and differed significantly across the 3 years ($p<0.001$). A significant association was observed between prior Biostatistics training and confidence in interpreting research data ($\chi^2=8.5$, $p<0.05$). Gender differences were significant only for knowledge scores ($p<0.05$).
Conclusions: Although postgraduate dental students generally recognise the importance of Biostatistics, gaps remain in practical application and statistical interpretation. While the attitude towards Biostatistics is generally positive, there is a notable deficiency in practical skills among postgraduates.

Keywords: Attitude, Biostatistics, Knowledge, Perception, Post-graduate dental students

INTRODUCTION

Biostatistics serves as a cornerstone of health science research and education, providing the foundation for designing scientifically sound studies, analysing data appropriately and drawing reliable conclusions.[1,2] For postgraduate dental students, an understanding of Biostatistics is particularly important because research forms an integral part of postgraduate training. It enables students not only to analyse their own research findings but also to critically read scientific literature, judge the strength of evidence and apply research findings appropriately to clinical practice.[1]

Despite its importance, Biostatistics is often perceived as a difficult subject by postgraduate students. The difficulty is not always related to mathematical ability alone; students may struggle because statistical concepts are taught in isolation from the clinical and research questions to which they are intended to be applied.

Studies among postgraduate learners have demonstrated gaps in the understanding of statistical methods and interpretation of research findings.[1,3] The difference between perceived understanding and actual competence highlights the importance of assessing not only knowledge but also students 'attitudes and perceptions towards Biostatistics.

Evidence from dental education further suggests that awareness of the importance of Biostatistics does not necessarily translate into the ability to apply it independently. A study by Best et al found that most participants recognised the importance of biostatistics in research, fewer were confident or willing to perform statistical analyses themselves, and many had difficulty identifying commonly used statistical tests.[4] Similarly, a study conducted by Penmetsa et al reported that students appreciated the importance of Biostatistics but continued to depend on experts when applying statistical methods in their research.[5] These findings suggest that the challenge lies not simply in knowing statistical terminology, but in developing the confidence and practical competence required to select, perform and interpret appropriate statistical procedures.

The role of structured teaching is therefore important in developing meaningful statistical competence. El Tantawi et al reported that participants' performance in a Biostatistics and research design course was influenced by factors such as previous academic performance, learning preferences, attendance and early performance during the course.[1] This indicates that Biostatistical learning is influenced by the way the subject is taught and integrated into postgraduate education. Likewise, evidence from dental education indicates that incorporating critical appraisal and research methodology into the curriculum can strengthen students 'ability to evaluate scientific evidence.[6] Recent evidence also suggests that research methodology and evidence-based dentistry teaching can improve critical appraisal skills, supporting the value of structured and practically oriented learning rather than relying solely on conventional theoretical instruction.[6,7]

In postgraduate dental education, these competencies become increasingly relevant as students' progress from the early stages of their programmed towards dissertation work, data collection, statistical analysis and scientific publication. However, differences in academic exposure, research experience, clinical workload and previous training may influence how students perceive and apply Biostatistics. Continuous exposure to real research problems, journal-based learning, statistical software and speciality-specific examples may therefore help students connect statistical concepts with the research questions encountered in their respective disciplines.

Although previous studies have explored Biostatistical knowledge and attitudes among dental and medical postgraduate students, there remains a need for institution-specific evidence comparing students at different stages of postgraduate dental training. Understanding how knowledge, attitude and perception vary between first, second and third-year post graduate dental students may help identify when students experience difficulties and which areas require greater academic support. Such information can guide the development of a more practical, research-oriented approach to Biostatistics teaching and help postgraduate students become more confident and independent in handling research data.

Therefore, there is a need to assess the existing knowledge, attitudes and perceptions of postgraduate dental students toward Biostatistics across different academic years and dental specialties, so that gaps in statistical competency can be identified and appropriate educational interventions can be planned.

The aim of the study was to assess and compare the knowledge, attitude and perception regarding the relevance and importance of biostatistics among first, second and third year postgraduate dental students across various dental specialties, and to identify gaps and areas for improvement.

METHODS

A cross-sectional study was conducted among 97 dental postgraduate students across various specialties in Master of Dental Surgery (MDS), such as Oral Medicine and Radiology, Public Health Dentistry, Oral and Maxillofacial Surgery, Prosthodontics, Periodontics, Conservative Dentistry and Endodontics, Pedodontics, and Orthodontics at Vokkaligara Sangha Dental College and Hospital in Bengaluru. All the three-year post-graduate dental students of Vokkaligara Sangha Dental College and Hospital for the academic year 2025-2026 were selected. Individuals who gave informed consent were included in the study. The study was carried out over a period of one month from March 2026 to April 2026. A convenience sampling method was used to select the samples, which included all the postgraduate dental students in the institution. Ethical clearance was obtained from the Institutional Review Board and Ethics Committee.

A validated, self-administered questionnaire was distributed to the participants through a Google Form with informed consent, ensuring voluntary participation and anonymity. The questionnaire consists of three sections: theoretical knowledge, attitudes toward biostatistics, and perceived barriers to its application in research.

Questionnaire validation was achieved through content review by subject experts comprising faculty members in Public Health Dentistry and Biostatistics. The experts evaluated each item for relevance, clarity, simplicity and necessity. Initially, the questionnaire contained 28 items:

10 on knowledge, 11 on attitude and 7 on perception. After content validation, one attitude item was removed due to inadequate relevance. Two new perception items were added, resulting in a final total of 29 items (10 knowledge, 10 attitude and 9 perception). Measured using a 5-point Likert scale (strongly agree, agree, neutral, disagree, strongly disagree). Followed by pilot testing to ensure clarity and reliability.

The data were collected through Google Forms. Data analysis involved Descriptive statistics like Mean and Standard Deviation, Analysis of Variance (ANOVA) and Chi-square test for the association between academic discipline and knowledge level.

RESULTS

The study included 97 postgraduate students aged 23-34 years (mean age approximately 25 years), comprising 79 (81.4%) females and 18 (18.6%) males, mean age approximately 29±3.46. Participants included 30 (30.9%) first-year, 38 (39.2%) second-year and 29 (29.9%) third-year postgraduate students from various dental specialities. A validated questionnaire was used to assess knowledge, attitude and perception (KAP) regarding Biostatistics. Following content validation and pilot testing, the final questionnaire comprised 29 items: 10 assessing knowledge, 10 assessing attitude and 9 assessing perception.

Knowledge scores were highest among third-year students (0.82±0.67), followed by first-year (0.44±0.47) and second-year students (0.37±0.71). Similarly, attitude scores were highest among third-year students (13.28±6.11), followed by first-year (10.37±4.23) and second-year students (7.42±5.77). Perception scores were also highest among third-year students (1.30±0.96), compared with first-year (1.20±0.70) and second-year students (1.00±1.10). One-way ANOVA demonstrated a statistically significant difference across academic years in knowledge ($F=12.47$, $p<0.05$), attitude ($F=4.62$, $p<0.05$), and perception ($F=11.726$, $p<0.001$) (Table 1).

Gender-wise analysis showed higher mean knowledge scores among males (0.56±0.67) than females (0.41±0.60), with a statistically significant difference ($p<0.05$). Although males also had higher mean attitude scores (10.66±5.89) than females (7.56±5.47), the difference was not statistically significant ($p>0.05$). In contrast, females demonstrated higher mean perception scores (10.58±5.44) than males (8.56±6.23), although this difference was also not statistically significant ($p>0.05$) (Table 2). Importantly, prior Biostatistics training was significantly associated with confidence in interpreting statistical data ($\chi^2=8.5$, $p<0.05$), highlighting the value of structured training in strengthening students 'statistical confidence and research readiness.

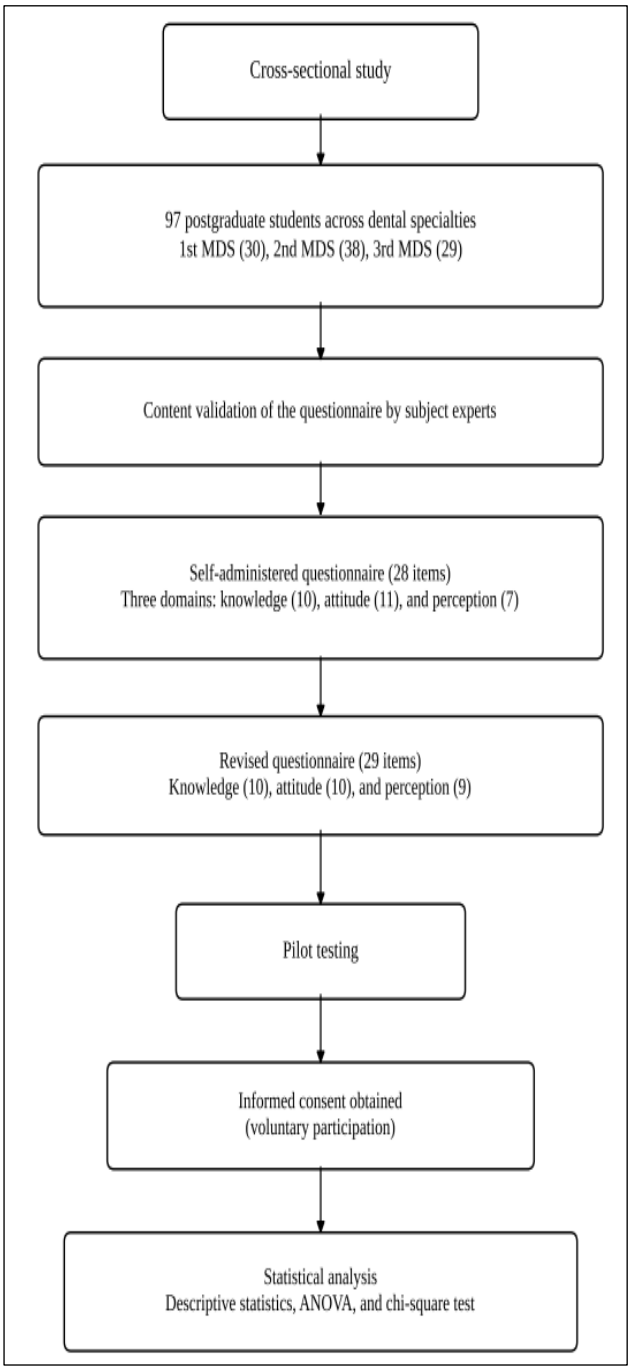

Figure 1: Study flowchart.

Table 1: Mean distribution of knowledge, attitude and perception across 3 years of post-graduate students.

Year of study	Knowledge	Attitude	Perception	ANOVA test value	P value
1st MDS (30)	0.44±0.47	10.37±4.23	1.2±0.7	F = 12.47	p<0.05*
2nd MDS (38)	0.37±0.71	7.42 ± 5.77	1.0±1.1	F = 4.62	p<0.05*
3rd MDS (29)	0.82±0.67	13.28±6.11	1.3±0.96	F = 11.726	p<0.001**

*Statistically significant; **Highly significant

Table 2: Mean distribution of knowledge, attitude and perception across gender.

Domain	Male (18)	Female (79)	P value
Knowledge	0.56±0.67	0.41±0.60	p<0.05*
Attitude	10.66±5.89	7.56±5.47	p>0.05
Perception	10.58±5.44	8.56±6.23	p>0.05

*Statistically significant

DISCUSSION

Biostatistics is central to postgraduate dental education because it supports sound research design, data analysis and interpretation of scientific evidence. In the present study, postgraduate students demonstrated moderate knowledge, positive attitudes and favourable perceptions toward Biostatistics, indicating that students recognised its importance but did not always feel confident in applying statistical concepts independently. This gap may reflect predominantly theoretical teaching, limited exposure to real datasets and reliance on statistical support. Similar findings were reported by Kumar et al and Penmetsa et al, although the latter observed higher awareness, suggesting that institutional curriculum and research exposure may influence statistical competence.[8,4] Knowledge increased significantly across academic years, with third-year postgraduate dental students scoring highest, possibly because of greater dissertation involvement and repeated research exposure. Conversely, the comparatively lower knowledge among second-year students may reflect increased clinical responsibilities and reduced research engagement during this transitional stage.

The consistently positive attitude across academic years suggests that students appreciate the relevance of Biostatistics. This positive attitude may stem from increased awareness of publication requirements, dissertation mandates and the growing emphasis on evidence-based dentistry. Findings by Patel et al, 2022, and Smith et al, 2023, are consistent with this observation.[9,10] Anxiety may persist when teaching lacks clinical context. This contrasts with Harshe et al, who reported more negative attitudes.[11]

Perception was highest among third-year students, which may be explained by their greater involvement in dissertation work, data interpretation and research activities. Similar findings were reported by Penmetsa et al and Joy et al, whereas Ille et al demonstrated that structured practical training can further improve students ' perceptions.[4,5,12]

Although males showed slightly higher knowledge scores, this finding should be interpreted cautiously, as statistical competence is likely influenced more by training and research exposure than gender alone, consistent with Sharma et al.[13] study. Importantly, prior Biostatistics training was significantly associated with greater confidence in interpreting statistical data. This supports the value of structured, practical training in improving conceptual clarity and reducing statistical anxiety. Overall, the findings suggest that knowledge and practical confidence can be strengthened when Biostatistics is taught through continuous, applied and research-oriented approaches rather than theory alone. Therefore, integrating real-data analysis, statistical software, dental specialty-based case scenarios and continuous mentorship into postgraduate training may help develop more confident and independent dental researchers.

The present study has certain limitations that should be considered while interpreting the findings. As it was conducted in a single institution, the findings may not be completely generalizable to postgraduate dental students from other institutions or regions. The cross-sectional design provides information at a particular point in time and therefore does not allow changes in students ' knowledge, attitudes or perceptions to be assessed longitudinally. Since the study relied on self-reported responses, the findings may be influenced by recall or social desirability bias. The inclusion of students from different dental specialties may also have introduced variation in their prior exposure to research and statistical methods. In addition, the study primarily assessed knowledge, attitude and perception and had a limited assessment of practical statistical skills, such as independent data analysis and use of statistical software. Finally, although differences in knowledge and perceptions were identified, the study did not explore the underlying learning gaps in depth, including specific curricular, teaching or individual factors that may have contributed to these differences.

CONCLUSION

The present cross-sectional study concludes that postgraduate dental students have moderate knowledge, positive attitudes and favourable perceptions toward Biostatistics, although gaps remain in the understanding and independent application of statistical concepts. Knowledge differed significantly across academic years, with third-year postgraduate dental students demonstrating higher knowledge, likely reflecting greater dissertation involvement and research exposure, while attitudes remained consistently positive and perceptions improved with academic progression. A significant association between prior Biostatistics training and the ability to interpret statistical results further emphasises the value of structured, practical learning. The study therefore highlights the need to move beyond theoretical teaching toward early, continuous and competency-based Biostatistics education, incorporating hands-on data analysis, statistical software, dental-specific case-based learning and mentorship. By identifying specific gaps between awareness and practical competence, this study contributes to dental education by providing evidence for strengthening statistical literacy among postgraduate

dental students, ultimately supporting greater research independence, improved quality of scientific evidence and more informed evidence-based decision-making in dental practice.

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